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ABSTRACT

Similarities and differences in attitudes and values among research faculty on items related to the nature of their work, the criteria sets for evaluating it, and the social and physical conditions under which it is performed are examined. Patterns of research activity are found to fall along lines that do not exactly correspond to the administrative structure that is designed to serve teaching, service, and maintenance of the organization itself. By means of a project-proposal system and peer-panel review at the inception of each project, a minimum of organizational disturbance would be introduced. (Author/KE)

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FACULTY PERCEPTIONS OF POLICY-RELATED FACTORS IN ACADEMIC RESEARCH

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Faculty Perceptions of Policy-Related Factors in Academic Research

William Toombs and Renee Friedman

First, in 1968, there was a drop in the growth rate of funds for research and development from all sources. (NSF 1974) Then there were sharp but selective cutbacks, shifts in program emphasis, closer attention to mission related outcomes and finally absolute declines in funding levels intensified by inflationary effects that, since 1973, have made more sweeping reductions in real resources available for academic research than any policy decisions at state or federal levels or in the foundations. (NSF 1975) (Halstead 1975) Such changes, along with others working in the same direction, placed increasing weight on decisions within universities as to how each institution's own resources could best be applied to research. Nationally, sources of support within the university budgets contributed a larger and larger share of the R&D expenditures in those institutions, rising from 32.3% in 1967 to about 36.4% in 1974. (NSF 1974)

Recognition of the complexities of this condition at one research university, the Pennsylvania State University, prompted a proposal by the Vice President for Research and Graduate Study, Dr. Richard Cunningham, to the National Science Foundation under its Management Improvement Program.[1] He set the essential problem as one of seeking criteria and information that would assist in the design of policies that could bring more flexibility to the use of internal resources for research. At best it would provide

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[1] This Study was aided by funds from the NSF-MIP program.

a way to enter new areas of research and excise less promising programs. That part of the study reported here examines similarities and differences in attitudes and values among research faculty on items related to the nature of their work, the criteria sets for evaluating it, and the social and physical conditions under which it is performed.

The complete study developed along two principal lines. One stream "evoked" from key personnel by means of interviews and detailed written exchanges a wide range of refined and thoughtful views about the current practice of research within the unviersity. It was qualitative in its emphasis and pursued the differentiation that characterizes scholarly work in the modern research institution. Interpretations were gathered from individuals who administered research at various levels and in many settings; departments, colleges, laboratories, institutes, and programs. The final report on that phase of the project offers an analytical description of the intricacies and particularities that have grown up around academic research over the last three decades. (SAMS 1975)

The second line of inquiry partially reported in the following pages took as a starting point the assumption that the university qua university holds a common and comprehensive view of research and similar scholarly activity. Questioning active research faculty yielded some evidence to support a hypothesis of congruence and, of course, considerable evidence to deny it. The nature of the differences were examined in detail. Such data can suggest which policies can be constructed on an all university basis, which must be fitted to strata or sectors within the institution, and which are so idiosyncratic that they are best left to the discretion of individuals.

A - Three Views of Research

This kind of comprehensive reconsideration of research activity in its pan-university dimensions brings to the surface three distinct conceptual sets. First, there is research as conceived and practiced in the disciplines, each a discrete area of knowledge. Then there is research as a generalized function of the university, the institutionalized notion of research or scholarly inquiry that places it beside teaching and public service as major functions. Third and finally, research has attributes that are shaped by views, values, interests, and practices emanating from national funding and policy making sources. There is a national ethos of research even though a national policy statement may be lacking. These three viewpoints can be seen as tidal currents moving on different courses but in the same general direction. Strictures in funding, like shallow waters, emphasize lines of turbulence between those currents. It is within the universities that many of the issues converge presenting leaders in those institutions with a penetrating problem of decision as they plan for allocation of scarce internal resources for research. Added to this is an internal flow problem. If funds for research must be recirculated from areas where the work level is declining into new prospects then accompanying adjustments in personnel, curriculum, and even faculties may also have to be made. For these reasons and others it is clear that an examination of research within one institution is an unfamiliar and sensitive process.

Some additional details on each of the three conceptual orientations noted above, disciplinary,university, and national, deserve mention: The habitual and, for this age, "natural" view of knowledge and the activities

associated with its creation and diffusion begins with the discipline. Scholars and scientists, perhaps artists as well, are socialized toward a commitment to carry out in particular ways the functions of teaching, research or similar activity, and dissemination within that disciplinary framework. (Kuhn 1963)

> "These commitments are the outcome of a prolonged training process, lasting well into adult life, in which the student is effectively isolated from competing vocational and intellectual interests and in which he is extremely dependent on his teachers." (Hagstrom 196

Each discipline has a coherence of its own established by "boundaries", some of which are vague, some firm. "Abstract principles and theories define scientific disciplines, the measures of which constitute relatively closed communities whose well-defined boundaries help to distinguish the members of one discipline from those of others . . . This closure enables peers to exercise great influence in the selection of problems to be studied and the techniquest to be used." (NAGI, CORWIN, 1972) Even though disciplines vary in their state of organization and even though each has marginal areas of uncertain definition, they remain the dominant organizational mode for ordering the body of knowledge in the Western world. Within universities that sense of coherence established by the bounded disciplines is reinforced by an administrative structure that lays down many department lines close to the boundaries of the disciplines.

In recent years there have been new attempts to construct a typology that would encompass the distinctions among departments and also link them to an epistemological base. Smart (1975) has pointed out that the recent work of Biglan carries these efforts beyond the organizational forms suggested by Kuhn (1967) Hobbs and Anderson, (1971) the political models of Baldridge, (1971) and the community formulations of Goodman. (1962).

Biglan derived a three-dimensional model for classifying departments by analyzing the responses of faculty to questions of similarity and difference in selected subject matter areas. He has tested the durability of the model with respect research activity, certain output indicators, and academic tasks while Smart has examined it with respect to goal setting. (Biglan 1971, 1973) The three dimensions Biglan identified are (1) the existence and strength of a paradigmatic structure, "hard" or "soft." (2) the nature of the subject matter under study in terms of "pure" or "applied" and (3) the systemic emphasis in terms of "life systems" or "non-life systems."

Although Biglan's taxonomy is effective in differentiating and ordering the disciplinary attachments of individuals there are two conditions with respect to research activity within a complex university that suggest the use of a modified classification. First, much of the research and related scholarly activity in the humanities and arts extends well beyond the disciplinary departments. Chemists, sociologists, or botanists to say nothing of petrogeologists, biochemists, and plant pathologists may be engaged in quite different kinds of research at a number of locations within the institution. Nagi and Corwin (1972) make the distinction by pointing out that the disciplines move toward a condition of closure that "... enables peers to exercise great influence in the selection of problems to be studied and the techniques to be used. In turn scientists become disposed to communicate their findings merely to their colleagues. By contrast research activities are organized into research fields which comprise subdisciplines (such as high energy physics) or an area of studies concerning a technological or social problem (space programs, health care, education, and so on.)"

There is a second reason for modifying the classification. Among its faculty members the university has included increasing representation from the fine and performing arts, the creative design orientation in architecture, and the practicing literary artist. Through display, performance, and publication of individual creative efforts these faculty members are involved in behavior similar to research of the classic form. The greatest similarity lies in university recognition and faculty tradition that these activities merit specific allocation of unstructured professional time and support facilities with the expectation that individual talent will generate significant outcomes. Because of these two conditions respondents in this study were asked to identify themselves with one of five "knowledge areas": natural science, humanities, social science, applied science and technology, performing and fine arts.

Within the framework of the discipline the habitual point of focus is the individual researcher. He is conceived as the major "instrument of inquiry" by virtue of training and intellect. (Mooney 1966) (Schon 1967) Three main lines of concern are displayed in the literature: (1) How to identify the most effective researchers, either before they reach professional maturity or in retrospect, (2) What environmental features support and enhance individual research productivity, (3) how interactions and diffusion can be used to increase overall research effectiveness and measure output. The power of the discipline-department view is so strong that most scholars carry its distinguishing marks in terms of values, methods, and acceptable systems of proof into other situations. University issues often become an extension of disciplinary issues and frequently other disciplines are perceived as competitors rather than equal co-workers.

Nevertheless, there is a more generalized perspective on research, a university view, an academic view in the full sense of the word. The university cannot neglect the wide range of intellectual activity from art to zoology which its trained faculty members pursue under their own impetus. How broad the scope of research and research-type activity can and should be is still to be defined but there is wide agreement that it has reached exceptional levels in the US during the past two decades. (Ben-David)(1973) In applying part of their resources to support of a broad band of intellectual inquiry universities incorporate many functions that are of small interest to the individual engaged in discipline-based research. Funds may go as seed grants to prompt external funds, as tide-over support while new sponsors emerge, as sustaining support for worthwhile endeavors that have no chance of extra-mural funding, as high-risk investments in new areas of inquiry or instructional experimentation, as development grants for young or promising faculty members, as support for popular activities with great public appeal. The university-wide view of research seems so different from the disciplinary perspective that some have suggested it can be treated as a "managed" activity. A considerable literature has emerged around the management of research, largely as it is conducted in industry or government laboratories.(Yovits 1966)(Mendelsohn 1963)(Walter 1965)(Langrish 1972) (O'Toole 1973)

The management approach was set aside by this project in the belief that research activity and the individuals who conduct it within the university cannot be directly managed without destroying key features of the creative process. Further, research activity is intimately bound into instruction, governance, and public service, a fact which immeasureably increases the complexity of directive management. What may be subject to

management-type decisions are matters like the setting and support elements for research and the relative emphasis among various fields.

Finally, decisions of university leaders about research have additional and extended importance because they must often be made without clear guidance from public policy statements about the sciences, arts, or humanities to give a sense of direction. Morison recently commented on the parallel circumstances in the foundations where "... scientific priority setting can be thought of as a continuing effort to keep these two rather poorly matched horses 'needs and leads,' pulling in the same direction on the same road." (Morison 1973)

National funding patterns and practices have generated effects on the way research is carried out in the academic setting. In order to continue the contact established with scientists who had served in specialized weapons laboratories during World War II but returned to the campus the federal agencies followed the project system. Although the practice had its beginnings in 1937 with the National Cancer Act, the pattern of project grants to established individual researchers working within an identified problem framework became the dominant mode of operation for sponsored research in the academic realm. Universities as institutions were, in a sense, third parties to these arrangements and faced significant administrative challenges in the questions of how to gain adequate compensation for indirect as well as direct costs and how to develop educational benefits from sponsored research. A quite different tradition of research organization comes from the land grant institutions and agricultural extension efforts, forerunners of institutes and centers (Ikenberry, Friedman 1972). There were, of course, other types of research support; traineeships, programmatic grants, institutional awards but the project system with increasing emphasis on "mission-oriented" results remained dominant. (Murtaugh 1973)(Piel, G. 1973)(Bennett, 1973)(Science Board at Canada 1973)

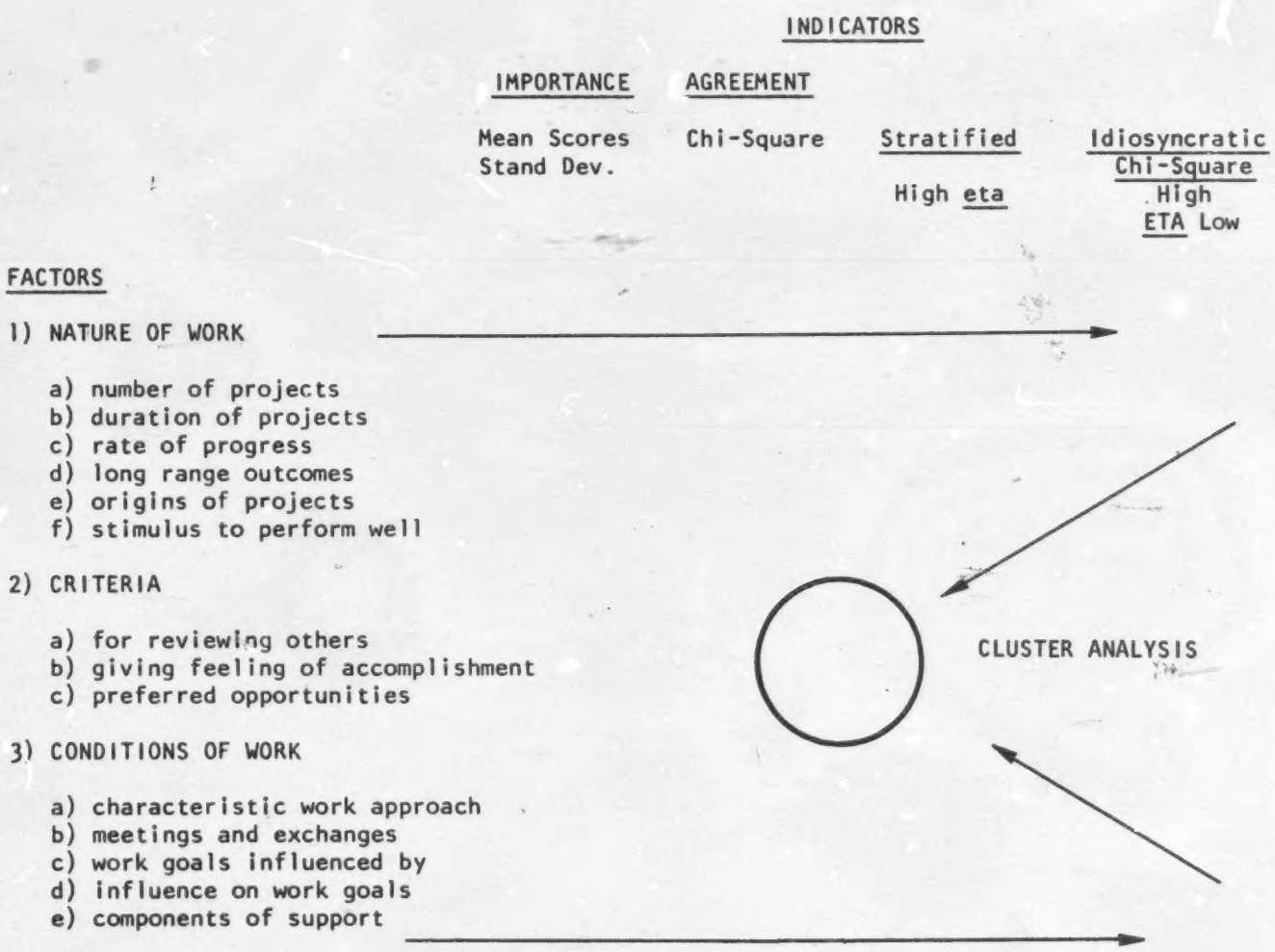
In summary, reductions in the real dollars for academic research press universities to examine how their own resources for research can be used more effectively and more flexibly. In seeking a basis for such policy the universities find themselves at the confluence of three different conceptual currents about research; disciplinary, institutional, and national. As a prelude to policy changes, then, it is desirable for an institution to establish the principal perceptions of research held by its own research faculty.

B - The Research Design

The essential logic of the design can be summarized briefly even though a full interpretation of the results is a much more complicated process. Getting at the views of research faculty within an institution is best described as a task of "descriptive analysis". Some of the factors around which questions are constructed reflect local needs for information, the length of time covered by a typical project, for example. It is advantageous and necessary to introduce other items on which responses can be compared to the results of other studies related to the topic, the sociology of science and the social psychology of research organizations, for example.

An obvious first step in analyzing the data is to summarize the relative importance assigned to items by the respondents in the sample. Since the hypothetical assumption is one of congruence among all research and related activity in a university setting the next action is to identify those items on which there is considerable agreement. Dissimilarities may take two principal forms; they may be grouped or statified along easily identified lines or they may be idiosyncratic to individuals and scattered throughout the sample. It would be desirable to know whether these differences "cluster" in some unusual way and such a factoral analysis can be made.

DIAGRAM OF RESEARCH DESIGN



Such a design should yield a set of items on which there is great agreement among all faculty. These might be incorporated into university-wide practice. Those differences which are grouped in identifiable ways can be communicated to peer groups charged with review of research. Indeed, they may suggest an appropriate number and composition for such peer review panels. Finally, those differences which are randomly distributed should probably be left to the choices of individual investigators.

It is important to note that the topic is research and research-type activity across the university. The limitations of the sample make disaggregation to the level of a department or program impossible. In one case, Fine and Performing Arts the number in the sample is small and a more detailed study based on interviews is underway.

C - Method

1) Sample & Collection: The process of identifying "active research faculty" among the 3200 or more persons associated with the University in some form of faculty relationship began with an examination of the list of publications and related work published annually. Setting aside the medical school along with a few other exceptional units gave an effective "research faculty" population of about 2100 persons.

Originally 211 Penn State faculty members with tenure or tenure eligibility were chosen by means of random sampling (KRAND Computer Program) from the faculty index in Research Publications and Professional Activities July 1, 1972-June 30, 1973. Since only two faculty members who were representative of the creative and performing arts component of the University appeared in the initial list an additional random SUB sample of 18 was drawn, in random fashion, from the College of Arts and Architecture. In total, the potential sample was 229.

Ten faculty members were selected [illegible] the University, three performance scholarship activities and active participation in research [illegible]

The rank distribution of the 213 [illegible] as follows: 107 (50 percent) full professors, 60 (28 percent) associate professors, 46 (22 percent) assistant professors. In terms of the four major knowledge areas used for this study, approximately 9 percent [illegible] the creative and performing arts, 39 (18 percent) were from the social science disciplines, 78 (37 percent) were in applied and professional fields, 42 (19 percent) were [illegible] and 27 (13 percent) belong to the humanities. There [illegible] which the respondents placed themselves in their [illegible] "knowledge areas" with the area colleagues [illegible] agreement of 73 measured by the ratio of number in [illegible] same discipline to [illegible] scholarly interests and [illegible] of such variation [illegible] who completed the questionnaire, and [illegible] checked the natural sciences and the social sciences [illegible] technologist. Given [illegible] one would anticipate that [illegible] and technological groupings. [illegible] of the 213 sampled respondents.

The initial mailing was followed by [illegible] sending of additional forms, phone [illegible] us of their intention not to provide the information. A total of 95

questionnaires were received, a response rate of 76 percent. By rank, the returns were as follows: 86 full professors (51 percent), 52 associate professors (31 percent)and 29 assistant professors (17 percent). The balance by rank among the respondents is reflective of the total sample. (Table 1) In terms of knowledge areas, the returns are slightly skewed. Of the 169 responses 10 (6 percent) checked the creative and performing arts option, 55 (32 percent) indicated their research interests in the social sciences, 46 (28 percent) viewed their work as applied, 41 (25 percent) considered themselves to be natural scientists and 17 (10 percent) chose the humanities category. In effect, the creative and performing arts and the humanities are under-represented. Another difference emerged. Responses by rank were consistent with sampling expectations except for the above named categories. Proportionately fewer full professors in the creative and performing arts and humanities responded to the questionnaire.

2) Construction of the Survey Instrument

The basis independent variable used a control in the analysis reported here has already been noted, the knowledge areas: natural sciences, humanities, social science, applied science and technology, performing and fine arts. Conventional background data were gathered including the usual academic set; rank, college, campus location, tenure at the University, along with demographics; age, sex. Also collected in detail was information about secondary academic involvements, affiliations, and responsibilities, both within and outside the institution. Elements of an educational history include fields and subspecialties, degrees and conferring institutions.

The development of dependent variables proceeded in accordance with two rationales. Some factors and items were included because operational

information was needed. Such fundamental questions as; "Is research activity actually conceived in terms of projects or task units by most participants? Is more than one project in progress at any given time? What is a typical span of time? A Year? A lifetime?"

To select other significant factors we turned to the literature which has studied research as a general class of activity. Much of this is identified with the sociology of science or the social psychology of organizations. One possible design could have replicated many of these studies by dichotomizing respondents into "high" and "low" research producers of productivity then analyzing the correlates that appear in this University. As an initial step to detailed analysis this promised very limited results. Freeman (1969) has pointed out, that such information is likely to be accurate only if the subject pool is large enough so that individual variations can be ignored. "To everyone who is familiar with research, it is obvious that it may be dangerous to rely on a simple count of numbers of papers in assessing the output of any particular individual or small group. But it does not necessarily follow that such quantitative techniques cannot be applied to much larger aggregates... It may be legitimate to use quantitative measures as a substitute for qualitative assessment or a combined quantity-weighted-by-quantity of scientific papers does not vary greatly from the combined quantity/quality indes." It was decided, therefore, to construct or include items or questions from other studies in which a relationship between productive research activity and the item factor was already demonstrated in the literature. (Smith, Fiedler, 1971) And the evidence is rather well established. (Bayer & Folger, 1966)(Hagstrom, 1965) Freeman has identified three main output measures for the sciences and they have analogues in the arts and humanities: publications, discoveries, and peer evaluations. (Freeman, 196 Other studies use manifestations or proxies of these in the form of citation index, recognitions and awards, membership, and visibility, what the Coles

characterize as the "property" or "wealth" of academics(Cole and Cole, 1973) From such investigations one can extract a number of factors which correlate well with research productivity. (Price, 1967) Many of them hold significance for policy design on an institutional level. For example, visibility of faculty to fellow researchers - not one of the variables we used here - correlates well with rankings of the department, r = .57. A policy decision to upgrade or even sustain the relative quality of a given department necessarily requires support for the kind of activities that enhance visibility of members (Cole and Cole, 1973).

The most useful single source for guidance on the issue addressed here is the work, extended over many years, of Donald Pelz. (Pelz and Andrews 1966). He provided several versions of survey documents designed to penetrate the environments in which researchers work. By adapting his format to about one third of the questions presented to the sample group of faculty it was possible to gain richer interpretations of the local data. While this assistance was freely given by Professor Pelz he had no share in the shortcomings of this design. To illustrate this utility: Pelz found for most groups "a very slight tendency for scientists to perform better if they worked on two or three projects rather than one or more." Scientists needed the mix of activities which utilized two or three different skills. Local findings matched this general conclusion but if they differed markedly further questions would be raised. The work of Crane (1972) in detailing the formal and informal mechanisms of communication provide a base for interpreting exchange and influence. Hagstrom's (1965) basic work along with subsequent articles provide

understanding of both individual and social dimensions of research. Cole and Cole (1973) have treated the exchange process among scientists and also explored in detail the characteristics of elites within the discipline. In summary, the questions have been constructed or selected to generate information that can be evaluated against the data and conclusions of previous studies that are more extensive and more complex in their analysis of correlates linked to research productivity.

C - Analysis

(3) All item responses were first listed by frequency to give mean values and standard deviations. In the tables to follow items are ranked by mean score. Appropriate items were then cross-tabulated with five basic knowledge areas as the control variables. Chi square values were obtained to assess the degree of difference in such a distribution. The value of eta was calculated to reveal differences that were distributed in an unequal fashion among the knowledge areas. Eta is an asymetric statistic applicable when the independent variable is nominal level, (knowledge areas) and the dependent variable is interval or ratio , a condition met or assumed in the case of item values. Eta "is basically an indication of how dissimilar the means are within the categories of the independent variable." When the means are identical eta is zero and the maximum difference among means give a value of one. Eta squared gives a correlation ratio that has an intuitive interpretation as the proportion of variance in the dependent variable explained by the independent variable. In the data recorded here values of eta .20 are taken as meaningful indicators of difference Computing procedures are all drawn from Statistical Package for the Social Sciences (NIE 1975) and from CLUSTRAN I.B.

Table displays give a measure of comparative importance of the item through the mean scores. Of course standard deviations give an indication of agreement on that importance. The chi-square values, where they exceed the .05 level reflect a dispersion of answers when data are tabulated by field of knowledge. If these differences fall along lines of the five knowledge areas the value of eta will be high, above values of .20 in most cases. In cases where standard deviations and chi-square are high and eta low we are dealing with an idiosyncratic difference not related to field of knowledge.

To examine the patterns of variance more carefully a cluster analysis was performed. The question was; What groups are visible in the sample when items showing differences are clustered? Procedures were programmed afterward. Ward's analysis.

D - SUMMARY OF FINDINGS

The dimensions of similarity and difference among sample responses are reported under the three principal categories, nature of work, criteria, and conditions of work. In each case a general statement is followed by a discussion of the important items and the nature of the differences among fields. The results of a cluster analysis are dealt with last.

1) Nature of Work: Tables 3,4,5,6, 7.

Research faculty in all fields considered their work in terms of projects or similar discrete units of activity which were viewed as highly individualized and extending over three to five years. Active faculty tended to have three or more activities underway (73%) and they depended most heavily on their own ~~university~~ initiative and work to provide both clues to new ventures and standards for judging performance. Effects from within university sources were small irrespective of whether the agent was colleague, department chairman, or adminsitrator at college

or university level. The low collegial influence is in contrast to Pelz observations that a "creative tension" emerges from the immediate social environment in cases where productivity is high.

As the eta values in Tables 6 and 7 indicate, there were some variations among fields. One's own university contact was rated lower as a source by Applied Fields and Performing Arts respondents. Applied Fields, understandably, found more importance in practical problems and the interests of clients or sponsors. Those in the arts gave more emphasis to the role of department chairman even though the scale value was low. The distribution (not shown) also reveals a division in the social sciences on the relationship of practical problems and applications to one's work with one group perceiving "large" or "strong" contributions and the others tending toward the low side. The significance of in-house colleagues is judged very low for Humanities, quite scattered for Social Science, and highest for the natural scientists. "Colleagues elsewhere" are evaluated consistently across the fields receiving a moderate rating as a source of projects and a strong rating as a stimulus to performance. The consistently low ratings given department chairmen with respect to their role in research activity can be explained more completely by some of the findinngs gathered in the qualitative part of the total study. In an interview setting great emphasis was placed on evaluating research activity as part of the total academic program not as in independent phenomenon. In that light it is clear that department heads and, college staff as well, have responsibility for several lines of performance, for the whole program, rather than for one single sector.

2) Criteria: Tables 8, 9, 10.

The results from this section of the study demonstrate more clearly than any of the others the principal patterns of distinction that exists within the university with respect to research activity. Across all respondents there is consistent agreement and high ratings for one set of values whether they are being applied to the proposals of others, used to judge one's own accomplishment, or considered in relation to a piece of research work. The importance of creativity, critical ability, contributing by inquiry to new knowledge, and professional freedom is universally acknowledged. These reflect aspects of the norms of science developed by Merton (1957) and explored by subsequent investigators. In the course of this study several federal agencies provided copies of materials they prepared for use by peer review panels and, again, these primary criteria appear. (TABLE 8 AROUND HERE)

Beyond this fundamental value structure these are sub-groups which use what might be labeled "secondary" criteria to discriminate among projects in their field. A sense of involvement with national missions appears to be one of these but the list also includes endorsement of industriousness, and a helping orientation. The invididualized differences in these responses include a few that are generally regarded as, more universal in scope, producing technical and scholarly papers is one, and collegial relations another.

The idea of peer judgement is probably given greater emphasis and applied more widely in the academic world than it is in the other major professions. Across the five knowledge areas there was little distinction on two major criteria, creativity and critical ability but on the significance of technical ability there is a difference. A third of the social scientists and about 40% of the natural scientists gave it a higher rating than all others in the sample. Within fields there are

technical frontiers as well as intellectual frontiers and this pattern of judgement reflects it. Although the eta value signifies a difference among fields the effect is generated by a split among respondents in two fields. Methodicalness which includes precision and thoroughness is more a matter of personal style than the other criteria but no group gave it low ratings. (TABLE 9 ABOUT HERE)

The criteria applied in self-judgement of accomplishment or satisfaction revealed a strong "helping others" orientation in the Applied Fields where it is consistent with the land grant service tradition and also in the Social Sciences. A sense of participation in national mission and a high value on this source of accomplishment is very important for 30% those in the Applied Fields and especially professors in that area. About ¼ of the Social Science respondents and National Science group shared the emphasis citing this source as the most significant. Contributing to the technical literature appears to be a product of individual interest and, except for the arts, endorsement of its importance comes from a small group of "high raters" in each field. The quality of producto was important to Applied Fields, understandably but it was also emphasized by respondents in Humanities. (TABLE 10 ABOUT HERE)

What researchers look for in projects that come to their attention brings the criterion question together in a performance setting. Again we find the universal values leading; freedom, new areas, and personal challenge. The pattern of emphasis on national mission for Applied Fields and Natural Science appears again. Another characteristic difference, work on team research, emerged here from the emphasis on competence in colleagues and in the chief or leader. It is the Applied Fields that give importance to these opportunities.

3) Conditions of Work: Tables 11, 12, 13, 14

This heading includes three aspects of working conditions. The first touches the preferred approach individual make to research and research-type activity. A second set of questions explores several of the social factors; frequency of meetings and exchanges, who the respondent is influenced by, and who he has influence on. The last section deals with environmental components and preferences about them. (TABLE 11 ABOUT HERE)

a) In preferred approaches to work there is a common element in the profiles reflecting the general value structure and emphasizing the intellectual setting of the problem; bringing order out of chaos, applying or finding general principles, looking at new areas, and developing ideas inside one's head all fit into that condition. But there are differences of view on whether these attractions are found in the subject matter of the field as is the case in the natural and social sciences, or developed by interaction with associates from the external environment as is the case with the applied fields. In the humanities this apparently emerges over a longer time through association with a topic. Only those in Performing Arts have a strong interest in shifting projects rapidly. There is no particular emphasis on instrumental values such as getting ahead in the organization or building a professional reputation. (TABLE 12 HERE)

(b) The social setting in terms of meetings and exchanges of influence shows "colleagues elsewhere" to be about equally important in all fields with the same level of contact. The pattern for colleagues within the university differs quite significantly. Natural scientists report the greatest frequency of contact with colleagues and see themselves as being influenced by those contacts. The social science group also has

considerable interaction but the exchange of influence is less marked. The Applied Fields show a moderate level of contact but they are highly influenced by it. The Humanities and the arts have the lowest levels of contact and influence among colleagues. These patterns suggest that the functions of inter-collegial exchange may be quite different for each of these basic groups. The social science group apparently values the exchanges but does not necessarily act on them in selecting projects. The influence of self is very high in the humanities and somewhat lower in the Applied Fields and the Performing Arts. (TABLES 13 & 14 ABOUT HERE)

The patterns of interaction and influence that emerge around the department chairman are interesting. It is in the Performing Arts that the chairman is contacted most often and has the greatest influence. In Applied Fields his influence role is significatn but contact is lower than in the sciences. Humanities report very low interaction levels and equally low influence exchange.

Interaction with sponsors follows the expected pattern of differentiation among fields with Applied and Natural Sciences displaying the greatest concern. (TABLE 15 ABOUT HERE)

(c) The composition of a climate or environment of support for research and scholarly activity as seen by research faculty shows more variety and even a slightly different emphasis than casual conversations would suggest. The high rating given "flexible organization" recognizes the increased emphasis on research areas that extend over several sub-disciplines or fields such as energy development, mental health, water and art quality, or geomtology. On field visits to two major research universities we found an active discussion on this topic underway. The emphasis on high risk funding probably reflects the overall tightening on sponsored projects and the difficulty of supporting extra activity under contract terms. There is more agreement

on the importance of those mainstays of university research, libraries and computer centers, than the index values might indicate. Performing Arts gave unusually low ratings to this particular form of support. It was the Applied Fields, incidentally, that gave the heaviest emphasis.

Differences by field show some significant variations with policy implications. The value placed on "high priority for research" was high for the social sciences and probably reflects more requirements from teaching in those disciplines than in the natural sciences. Social Sciences and Humanities valued secretarial support more highly than did other fields. The importance of graduate assistants is greatest for the pplied Fields followed by Natural Sciences. The other variations marked by high eta values, specialized equipment, liaison with funding agencies, and policy guidance on research follow expected patterns with Applied Fields giving the greatest emphasis.

Idiosyncratic differences appeared around availability of travel funds and fiscal sciences instead of one environment of support for research within a university there are likely to be numerous constellations of services, facilities, and priorities, each linked to a particular set of needs, some of which are permanent, others temporary.

Cluster Analysis

To identify significant groupings which might be concealed by simple cross tabulations 69 variables were standardized and treated using CLUSTAN I-B (release 2) program. Most of those variables are marked (+) in the tables. The procedure for clustering followed Ward's method and generated solutions of 3, 4, and 5 clusters. The four and three cluster solutions were examined and the three cluster version accepted on the basis of its sharp reduction in error sum squares over the four cluster version.

"Cluster 1" contains 94 cases. This group places a high value on collegial relations, whether with peers or superiors and expects high competence in them. They see themselves as able to influence the department chairman and would like to advance themselves within the national service organization. There is an emphasis on long range interests Motivation is viewed as individual, not related to sponsors or clients. This cluster reflects the qualities of an "Integrated Academics" and that seems an appropriate label.

Cluster 2 contains 44 cases. The emphasis is on applied problems that can be solved quickly and yield benefits that have utility and recognition. This group sees its work as linked into commercial processes and with methods to control the environment. To identify fruitful areas they would welcome policy guidance, leads to research sponsors, and methods of identifying client needs. There is an expanded view of teamwork which incorporates colleagues, sponsors, and the institutional resources to get answers to problems. The time frame envisioned for projects is relatively short 1-2 years, a marked contrast with the other two clusters. This group embodies many of the features which have become identified with land grant service tradition of experiment station and extension work. The label here could well be "Applied Innovaters".

Cluster 3 contains 31 cases and the most appropriate label is "Committed Individualists". Rejection of the lines of association within the university and without are reflected. Whereas Cluster1 shows independence within the establishment, group 3 values freedom from any ties to colleague or client. They see their work as extending over a long time span and report a slow rate of progress. Since the direction of emphasis in the survey document was toward identifying outreach and contact this cluster established its credentials by

rejecting many of the choices.

The implications for research policy in the cluster data point principally toward the composition of peer review panels. Although it might be conveivable that a single peer panel could comprehend all research proposals within an institution such a panel would be forced to operate at a high level of generalization. By creating three panels, each prepared to work at proposals fitting the cluster descriptions, the full benefit of expert judgement could be gained. Panel I could consider proposals that tie in with teaching, collaborative scholarly projects, proposals that have strong departmental endorsement. Panel 2 could deal with proposals that would either lead to client and sponsor affiliations or would follow up on such relationships. Since the applied emphasis is likely to tie into commercial possibilities the panel should be prepared to consider development, innovation, and marketing possibilities. The third panel could consider high risk, individualized proposals which could probably be evaluated only on the basis of internal strength. These would be likely to extend over a longer time span than any of ther others.

The cluster analysis is a useful heuristic device and the results deserve to be explored and refined. It does describe, well the basic strata of research behavior and interests but there are questions still to be considered about how an operating version of the panel structure would fit into the other activities and organizations of the unviersity.

E - CONCLUSIONS

The project goal was to develop information about research activity that might be of use in policy formulation at the university level. To carry out the inquiry an assumption was made that all research and

scholarly endeavor in the university setting is basically alike. This, of course, is equivalent to the null hypothesis of "no significant difference." As it turns out there are large areas of agreement but only part of it can be translated into policy statements. The remaining areas of agreement may be identified but their full meaning can come only by interpretations of evaluating peers. There are differences, too, and the abbreviated tables display indicators of the kinds of variation to be formed. For these reasons the conclusions go beyond a summary of the findings and embody the policy implications.

1) In-house research activity could be organized on a project basis with formal proposals put forward by individuals who might expect funding over a period of, three to five years. Information gathered by this study shows that research activity is conceived in terms of discrete units which generally occupy a share of one's efforts over three or more years.

2) The primary criteria reflecting quality standards and basic priorities can be stated as university wide policy. They will fall very close to the lists prepared by agencies or foundations and emphasizing originality, sound design, advancement of principles and theory, freedom for the investigator.

3) The most suitable method of reviewing proposals would be three research review panels. They would have no role in post-audit of research work because the outcome effects are more properly part of total program review, as the other segment of the NSF-MIP project demonstrated. These panels would each treat projects of a particular kind reflecting the distinctions that were categorized by the cluster analysis. There would be some overlap among the proposals seen by the panels but this is preferable to drawing tight lines which allocate disciplines to particular panels. This conclusion reflects the fact that in both the natural

sciences and the social sciences there are clearly two types of research activity, technical and general.

4) The information developed here suggests that the role of department and college in the specific activity of research is minimal. Their importance rests with the construction and evaluation of the total academic program of which research is only one part.

5) The 'climate' of research support apparently contains many "weather" patterns each requiring a different combination of resources. Flexibility in the terms of in-house grants would meet these variations just as they are now met under conditions of outside funding.

6) Within the sample group the emphasis on individualism and independence is high, perhaps too high to achieve the collaborative effects cited by Deutsch and Platt (1971) Langrish (1972) and others. An in-house grant program emphasizing joint projects that involve members of two different administrative units, departments, institutes, etc. offers one way to encourage more collaboration.

This study has suggested by its findings that the patterns of research activity fall along lines that do not exactly correspond to the administrative structure which is designed to serve teaching, service, and maintenance of the organization itself. Acknowledging these research patterns and supporting them in ways best suited to their needs does not require a complete reorganization as some have suggested nor does it seem to require isolation of research. By means of a project proposal systems and peer panel review at the inception of each project a minimum of of organizational disturbance would be introduced. Research would still bear a fundamental relation to teaching and other institutional missions. Department heads and deans would still be the agents of ultimate review

on matters of program and personnel. The distinguishing difference would be that research ideas and resources brought together in a manner which the data here suggests, would be more effective.

TABLE 1

RESEARCH FACULTY STUDY

SAMPLE AND RESPONSE: BY RANK AND FIELD OF KNOWLEDGE

CATEGORY	SAMPLE Rank	N	RESPONDENTS N	PERCENTAGE RESPONSE
Applied Fields	Full	38	28	.74
	Associate	30	15	.50
	Assistant	4	3	.75
Subtotal		72	46	.64
Natural Sciences	Full	25	25	.100
	Associate	9	9	.100
	Assistant	10	7	.70
Subtotal		44	41	
Social Sciences	Full	27	26	
	Associate	21	19	.90
	Assistant & other	10	10	.100
Subtotal		58	55	
Humanities	Full	12	5	.42
	Associate	9	7	.78
	Assistant & other	6	5	
Subtotal		27	17	
Performing Arts	Full	5	1	.20
	Associate	6	4	.67
	Assistant	9	5	.56
Subtotal		20	10	.50

TABLE 2 KNOWLEDGE AREAS AND COLLEGE REPRESENTATION

	Agriculture	Arts & Architecture	Bus. Administration	Earth & Mineral Science	Education	Engineering	Human Development	Liberal Arts	College of Science	Emeriti	
NATURAL SCIENCE	10	0	0	2	0	1	1	1	26		41
HUMANITIES	0	0	0	0	1	0	0	15	1		17
SOCIAL SCIENCE	13	1	4	2	7	0	6	22	0		55
APPLIED FIELDS	16	0	3	4	0	15	0	0	6	2	46
FINE & PERFORMING ARTS	0	10	0	0	0	0	0	0	0		10
	39	11	7	8	8	16	7	38	33	2	169

TABLE 3

RESEARCH FACULTY STUDY

NUMBER OF MAJOR PROJECTS OR EFFORTS

CATEGORY	Rank	1	2	3	Totals	None
Applied Fields	Full	3	5	19	27	1
	Associate	-	1	13	14	1
	Assistant	-	-	3	3	-
Subtotal		3	6	35	44	2
Natural Sciences	Full	3	4	17	24	1
	Associate	1	-	8	9	-
	Assistant	2	3	2	7	-
Subtotal		6	7	27	40	1
Social Sciences	Full	3	6	18	27	-
	Associate	3	3	12	18	1
	Assistant	-	2	6	8	-
Subtotal		6	11	36	53	1
Humanities	Full	-	1	4	5	-
	Associate	1	-	6	7	-
	Assistant	-	-	4	4	-
Subtotal		1	1	14	16	-
Performing Arts	Full	-	-	1	1	-
	Associate	1	1	2	4	-
	Assistant	1	-	3	4	1
Subtotal		2	1	6	9	1
Grand Total (percentage)		18	26	118	162	5

TABLE 4

EXPECTED DURATION OF PROJECTS

CATEGORY		LESS THAN 6 MONTHS	.5-1 YEARS	1-2 YEARS	2-3 YEARS	3-4 YEARS	MORE THAN 5 YEARS	TOTAL
Applied Fields	Full	2	3	5	17	12	32	
	Associate	-	2	5	11	4	18	
	Assistant	-	-	1	4	3	1	
Subtotal		2	5	11	32	19	51	
Natural Sciences	Full	4	3	8	5	13	29	
	Associate	2	-	4	4	3	11	
	Assistant	-	2	6	1	-	5	
Subtotal		6	5	18	10	16	45	
Social Sciences	Full	11	8	15	9	7	18	
	Associate	3	11	13	7	5	6	
	Assistant	1	1	5	5	6	4	
Subtotal		15	20	23	21	18	28	
Humanities	Full	2	1	1	3	-	4	
	Associate	1	2	6	3	8	2	
	Assistant	-	3	17	-	1	1	
Subtotal		3	6	24	6	9	7	
Performing Arts	Full	1	-	-	1	-	1	
	Associate	-	1	4	1	-	3	
	Assistant	-	2	4	1	1	2	
Subtotal		1	3	8	3	1	6	
Total Projects Reported		27	39	84	72	62	137	

TABLE 5 LONG RANGE OUTCOMES EXPECTED: BY PERCENTAGE

13. Within the next ten years, how likely is it that your current work (other than teahcing)will result in practical applications to technology, in esthetic benefits, in policy applications or in other outcomes of use to society? Estimate percentage of your work (to nearest 10%) likely to have each outcome.

	None	1-19%	20-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100%	
Technology, social policy	25	21	15	30	5	14	11	12	14	13	16
Professional value	6	35	25	42	10	20	8	5	8	0	15
Contribution to knowledge only	6	60	38	28	5	14	0	5	1	3	16

TABLE 6 SOURCES FROM WHICH PROJECTS ORIGINATE: BY AMOUNT OF CONTRIBUTIONS

17. Listed below are several sources from which projects can originate. How much did each source contribute in originating any of your current projects?

SOURCE	Mean Score	s.d.	X^2	p.=	ETA
My previous work or plans	3.27	.75	15.58	.21	.173
My own curiosity	3.26	.82	25.07	.068+	.288+
Problems in practical application	2.27	1.44	43.73	.002+	.473+
Scholarly literature	2.15	.89	12.69	.69	.164
Colleagues elsewhere	1.75	1.05	19.17	.25	.041
Colleagues here	1.56	1.07	19.08	.26	.205+
Prominent Authority or Teacher	1.38	1.23	13.87	.60	.195
Client or Sponsor	1.21	1.19	35.31	.0036+	.381+
Department Chairman	0.62	.91	24.22	.084	.246+
Higher Administration	0.35	.77	15.62	.21	.186

N = 169 (Scale 1-5) (df = 16)

(+) included in cluster analysis

TABLE 7 SOURCES OF STIMULUS TO PERFORM WELL: BY AMOUNT OF STIMULUS

18. Regardless of the actual origins of your projects, what sources (in general) offer you the most stimulus to perform well?

STIMULUS	Mean Score	s.d.	X^2	p=	ETA
Own standards	3.58	.60	12.85	.37	.235+
Own previous work or plans	3.15	.82	14.97	.53	.122
Colleagues elsewhere	2.41	.92	9.50	.89	.120
Scholarly literature	2.25	.98	17.15	.38	.189
Problems in practical application	2.15	1.40	33.49	.006+	.403+
Colleagues here	1.89	1.09	18.48	.30	.215+
Prominent authority or teacher	1.48	1.20	8.05	.95	.098
Client or sponsor	1.46	1.28	26.40	.049+	.327+
Department chairman	1.19	1.04	13.64	.625	.197
Higher administration	0.72	.84	12.07	.74	.109

N = 169 Scale 1-5 df = 16

(+) included in cluster analysis

TABLE 8 CRITERIA FOR REVIEWING PROPOSALS OF OTHERS

19. Scholarly and creative activities call for a variety of abilities, some of which are listed below. In reviewing funding requests submitted by others how much emphasis would you place on the following factors?

CRITERION	Mean Score	s.d.	X^2	p=	ETA
Creativity, imagination, originality	4.54	.62	6.01	.65	.120
Critical ability, clear thinking	4.47	.60	6.25	.62	.163
Technical ability, grasp of field	4.17	.79	17.93	.33	.207+
Methodicalness, carefulness	3.83	.78	24.99	.069+	.178+
Energy, hard work, drive	3.71	.82	5.88	.92	.119

N= 169 Scale 1-5 df = 16

(+) included in cluster analysis

TABLE 9 SOURCES OF FEELINGS OF ACCOMPLISHMENT OR SUCCESS FOR SELF

21. Among the following experiences, how strong a feeling of technical "success" or "Accomplishment" in your field could each one give you? (Note: If your present work does not provide some of these, estimate how you would feel if the experiences were to occur.)

SOURCE	Mean Score	s.d.	X^2	p.=	ETA
Highly original or creative ideas	3.49	.73	16.60	.41	.107
Sound and careful work	3.27	.75	20.65	.19	.187
Helping colleagues and students grow	3.08	.77	29.75	.018	.302+
Contributing to national well-being	3.03	.93	18.34	.30	.216+
Publication that adds to literature	2.93	.79	37.78	.002+	.326+
Product of superior quality	2.61	1.16	30.31	.016	.218+
Satisfying a client or sponsor	2.41	1.05	27.95	.032	.313+
Executing work efficiently	2.18	.96	13.21	.658	.116
High commercial success	1.94	1.23	24.52	.079	.326+
Patent for new process	1.84	1.23	13.62	.63	.195

(scale 0-4) df = 16

(+) included in cluster analysis

TABLE 10 OPPORTUNITIES A PROJECT MIGHT AFFORD: IMPORTANCE OF EACH

22. Listed below are different kinds of opportunities which a project might afford. In selecting a project, how much importance do you personally attach to each of these?

	Mean Score	s.d.	X^2	p.=	ETA
Freedom of ideas	4.148	.807	9.54	.657	.116
Gain new knowledge	4.01	.810	14.23	.582	.164
Contributing technical knowledge	3.727	.913	23.98	.0899+=.090+	.176
Challenging problems	3.667	.939	14.60	.554	.152
Use of knowledge	3.50	.948	10.72	.953	.091
National value problems	3.455	1.222	24.97	.070+	.288+
Build professional reputation	3.263	1.06	26.67	.045+	.164
Work with competent colleagues	2.99	1.047	23.40	.104+	.301+
Congenial colleagues	2.97	1.114	21.29	.167	.156
Supervision by competent chiefs	2.45	1.150	18.36	.303	.203+
Additional income	2.19	1.048	18.12	.317	.217+
Administrative advancement	1.62	.879	5.54	.937	.147
Other	4.8	.405	2.03	.56	.43

N = 169 (Scale 1-5) (df - 16)

(+) included in cluster analysis

TABLE 11 CHARACTERISTIC APPROACHES TO WORK

23. Scholars may differ widely in their characteristic approach to their work - both the kinds of problems that attract them, and the way they go about the task. To what degree does each statement describe a.) aspect of the approach you typically prefer to use. (Note: Try to ignore limitations set by particular conditions of work, and describe the approach you prefer.)

	Mean Score	s.d.	X^2	p.=	ETA
Problems interesting themselves	4.35	1.50	25.35	.387	.297 +
Bring order and simplicity	4.28	1.38	29.51	.202	.151
Find general principles	3.65	1.45	33.67	.091+	.127 +
Find out by observation	3.37	1.50	28.15	.254	.270+
Develop ideas inside head	3.33	1.58	14.04	.946	.056
Long range related tasks	3.33	1.59	30.12	.181	.203 +
Probe deeply	3.11	1.58	26.94	.307	.209+
Lone Wolf	3.04	1.78	21.09	.633	.261+
Abstract Concepts	2.87	1.65	34.04	.084+	.191+
Find immediate solutions	2.78	1.49	30.80	.160	.187
Broad features of new areas	2.73	1.696	22.76	.534	.151
Team man	2.705	1.57	25.00	.406	.238+
Find loopholes and contradictions	2.70	1.69	27.44	.284	.208+
Build professional reputation	2.66	1.55	16.26	.878	.068
Control external environment	2.65	1.81	52.10	.0008+	.409+
Acceptable results	2.43	1.57	21.46	.611	.123

TABLE (continued)	Mean Score	s.d.	X^2	p=	ETA
Alter direction week by week	2.34	1.77	25.23	.39	.262+
Advance in organizational status	1.59	1.42	26.15	.161	.092
Right hand man	1.531	1.49	31.04	.153	.155+

N = 166 (scale 0-6) (df = 24)

(+) included in cluster analysis

TABLE 12 FREQUENCY OF MEETINGS AND EXCHANGES WITH OTHERS

24. How often do you attend meetings or exchange information about research activity with these groups?

	Mean Score	s.d.	X^2	p.=	ETA
Colleagues here	3.60	1.20	28.47	.099+	.250+
Colleagues elsewhere	2.99	1.05	14.71	.79	.149
Department chairman	2.17	1.41	32.17	.042+	.305+
Sponsors	1.40	.91	35.62	.003+	.407+
N = 169		(scale 1-5)		(df = 16)	

(+) included in cluster analysis

TABLE 13 INFLUENCED BY PERSONS OR GROUPS IN CHOICE OF WORK GOALS

25. Please note the extent to which the following persons or groups influence the choice of your work goals.

	Mean Score	s.d.	X^2	p.=	ETA
Yourself	3.699	.522	14.32	.280	.222+
Colleagues elsewhere	1.741	.953	21.76	.151	.125
Sponsoring agencies	1.591	1.218	35.22	.004+	.314+
Colleagues in the university	1.589	1.029	27.66	.035+	.161 +
Department chairman	1.159	1.071	19.73	.233	.184 +
Higher administration	0.593	.890	12.93	.678	.200+

N = 169 (scale 0-4) (df = 16)

(+) included in cluster analysis

TABLE 14 INFLUENCE ON POLICY-MAKING GROUPS AFFECTING WORK

26. Please note the extent to which you influence the following persons or groups in making policy decisions or choices that affect your work. Mark one per person or group.

	Mean Score	s.d.	X^2	p.=	ETA
Colleagues in university	1.599	1.042	11.53	.776	.226+
Department Chairman	1.510	1.113	24.59	.077	.193+
Colleagues elsewhere	1.478	1.007	19.10	.263	.193
Sponsoring agencies	1.303	1.306	27.152	.131	.322+
Higher Administration	0.735	.924	12.66	.394	.150

N = 169 (scale 0-4) (df = 16)

(+) included in cluster analysis

TABLE 15 COMPONENTS OF THE SUPPORT ENVIRONMENT

27. Scholarly, scientific, or artistic activities require a climate or environment of support. How important is each of these items?

COMPONENT	Mean Score	s.d.	X^2	p.=	ETA
Library, computer, technical aid	4.16	.97	35.02	.0039+	.337+
High priority for research activity	3.86	.95	35.27	.0037+	.328+
Flexible organization to meet new conditions	3.60	1.09	18.86	.28	.188
Funds for high-risk efforts	3.55	1.14	14.84	.53	.190
Graduate research assistants	3.54	1.09	32.77	.0079+	.342+
Travel funds for meetings	3.54	.95	24.88	.0719+	.180
Publication, display and performance	3.47	1.09	19.23	.256	.133
Secretarial, printing services	3.42	1.08	34.02	.0054	.326+
Specialized equipment	3.30	1.14	45.36	.0001+	.383+
Leads to research funds	3.04	1.08	10.36	.847	.105
Budget and financial service	2.98	1.15	23.93	.04+	.155
Aid with development and innovation	2.84	1.09	16.16	.44	.183
Liaison with funding agencies	2.84	1.13	32.74	.036+	.243+
Policy guidance toward critical research areas	2.50	1.09	17.99	.59	.236+

N = 166 (Scale 1-5) (df - 16)

(+) included in cluster analysis

CLUSTER 1 (94 cases) "INTEGRATED ACADEMICS"

		F-Ratio	T. Value
1	Project duration 6 months or less	.3851	-0.1225
27	Source of accomplishment - contributing to nation's well being	.5993	.2344
12	Progress on work very rapid	.5890	-0.0225
20	Stimulus to perform: own standards	.6735	.0314
29	Source of accomplishment: helping others grow	.7060	.2534
35	Project opportunity: contribute to nation's well being	.7085	.1173
60	Influence on funding agencies	.7350	-0.2692
33	Project opportunity: congenial co-workers	.7421	.2008
50	Meetings with colleagues	.7722	.1405
46	Characteristic approach: using abstract concepts	.7897	.0647
25	Source of accomplishment: producing a commercial product	.8061	-1.0804
22	Stimulus to perform: practical problems	.8137	.0861

CLUSTER 2 (44 cases) "APPLIED INNOVATORS"

		F-RATIO	T-VALUE
15	Outcomes of work will be theoretical	.2127	-0.5344
30	Source of accomplishment: solving sponsors problems	.2891	.6479
13	Outcomes will have direct application	.3938	.7922
11	Rate of progress: very fast	.4069	-0.1419
17	Projects originate in practical problems	.4189	.5974
26	Source of accomplishments: product with commercial sources	.4357	.3395
2	Duration of projects: very short 6 months	.4359	-0.2682
63	Support factors: liaison with funding agencies	.4602	.5938
25	Accomplishment from a commercial product	.4716	.7892
5	Duration of projects: 3 or 4 years	.4770	-0.2636
22	Stimulus to perform from practical problems	.4879	.5880
14	Long range effects: no direct application	.5466	-0.4901

CLUSTER 3 (31 CASES) "COMMITTED INDIVIDUALISTS"

		F-RATIO	F-VALUE
11	Progress on projects: very fast	.2000	-0.2328
37	Approach to work: projects interesting in themselves	.2912	.5997
19	Origins of projects: department chairmen	.3138	-0.5853
56	Influenced by: department chairman	.3143	-0.8523
18	Origins of projects: sponsors	.3744	-0.7951
52	Meetings and exchanges: higher administration	.4137	-0.5255
41	Approach to work: team man	.4556	-0.9212
38	Approach to work: advance in organization	.5002	-0.4666

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